NASA SBIR/STTR Technologies

Lunar Regolith Processing System (LRPS)

PI: Robert Gustafson, Orbital Technologies Corp., Madison WI
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Description and Objectives

ORBITEC proposes to develop an integrated lunar regolith processing system (LRPS) to produce oxygen and a variety of other useful materials to support future lunar exploration activities. The LRPS utilizes carbothermal reduction of regolith via a direct energy source to extract oxygen, silicon, iron, ceramics, and other useful by-products from lunar regoith. The LRPS products would be used for life support, propellant applications, solar cells (Si), electric wire or metal parts (Fe) and other infrastructure development (e.g. ceramics/bricks, fibers for composites, etc.). The LRPS concept eliminates many of the problems found with other lunar oxygen production approaches, such as the need for high-temperature containers and reagents from Earth and the need for extensive benefication of the lunar regolith prior to processing. OBJECTIVES are to:

1) Perform a systems requirements definition of the LRPS system.

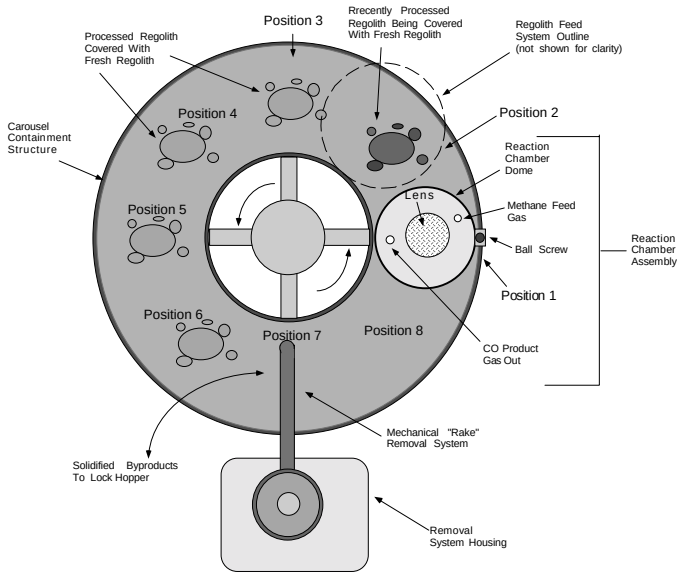
2) Identify and characterize the two identified CO conversion methods to determine which method best suits a space flight mission.

3) Design, assemble, and test a prototype CO conversion unit.

4) Integrate the prototype unit into a system capable of producing oxygen gas from lunar simulant using direct heating.

5) Obtain test results on both the CO conversion unit and the entire carbothermal reduction system to verify desired performance.

6) Produce a preliminary design for the Phase II bench-top LRPS system.



Approach

Task 1. LRPS System Requirements

Task 2. Evaluate CO Conversion Approaches

Task 3. Develop Prototype CO Conversion Unit

Task 4. Testing Prototype CO Conversion Unit

Task 5. Preliminary Phase II Design

Task 6. Reporting

Subcontractors/Partners

None.

Schedule and Deliverables

6 Months

Final Report

NASA & Commercial Applications

The results of this effort are applicable to future exploration and/or colonization missions to the Moon and beyond. Efficient and reliable production of oxygen and metals on the Moon will enhance and/or enable a variety of solar system exploration programs by providing a very cost-effective supply of oxygen for propulsion and life support in addition to raw materials. The LRPS products would be used for life support, propellant applications, solar cells (Si), electric wire or metal parts (Fe) and other infrastructure development (e.g. ceramics/bricks, fibers for composites, etc.). Development of technologies required for the processing of carbon monoxide could lead to methods of removing carbon monoxide and carbon dioxide from the atmosphere both in space and terrestrial atmospheres, and in support of reducing harmful emissions from waste streams.